

Sub D1
cont.

thereof; and (b) a hydroxyalkylating reagent selected from the group consisting of: a carbocyclic carbonate and a carbocyclic sulfite; in the presence of: (c) a phase transfer catalyst under conditions sufficient to form a dihydroxyl-functionalized material having a molecular weight not more than about three times greater than the molecular weight of said dicarboxylic acid-functionalized material.

21/2. The process according to claim 23, wherein said dicarboxylic acid-functionalized material has carboxyl-functional groups independently selected from the group consisting of: R and R¹, wherein each R and R¹ is independently selected from the group consisting of: COOH or CAA¹-X-COOH, wherein each A and A¹ is independently selected from the group consisting of: hydrogen, halogen, cyano, linear or branched alkyl having from 1 to about 5 carbon atoms and wherein X is a linear or branched alkyl having from 1 to about 5 carbon atoms.

C1
CM1
Sub D2
23. The process according to claim 1, wherein said dicarboxylic acid-functionalized material has a molecular weight of from about 3,100 to about 4,200.

Sub E1
24. The process according to claim 23, wherein said hydroxyalkylating reactant is a member selected from the group consisting of carbocyclic carbonate, carbocyclic sulfites and combinations thereof.

27/5. The process according to claim 24, wherein said carbocyclic carbonate is a member selected from the group consisting of ethylene carbonate, 1,3-propylene carbonate, 2-methyl-1,2-ethylene carbonate, 3-methyl-1,3-propylene carbonate, 1,2-dimethyl ethylene carbonate, 2,2-dimethyl butylene carbonate and combinations thereof.

28/6. The process according to claim 24, wherein said carbocyclic carbonate is ethylene carbonate.

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~~29~~ 7. The process according to claim ~~4~~, wherein said carbocyclic sulfite is a member selected from the group consisting of ethylene sulfite, propylene sulfites and combinations thereof.

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~~30~~ 8. The process according to claim ~~4~~, wherein said carbocyclic sulfite is ethylene sulfite.

²³
~~31~~ 9. The process according to claim ~~1~~, wherein said dihydroxyl-functionalized material is selected from the group consisting of the dihydroxyl-functionalized polymers of: polybutadiene, poly(butadiene-co-acrylonitrile), polyacrylonitrile, and combinations thereof.

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~~32~~ 10. The process according to claim ~~1~~, further comprising the step of providing an amphoteric treating agent in an amount sufficient to cause said dihydroxyl-functionalized material to separate from the reactants which remain and/or any by-products thereof.

³²
~~33~~ 11. The process according to claim ~~10~~, wherein said amphoteric treating agent is a member selected from the group consisting of silicated magnesium oxide, magnesium oxide, magnesium hydroxide, calcium hydroxide, barium hydroxide and combinations thereof.

²³
~~34~~ 12. The process according to claim ~~1~~, wherein said phase transfer catalyst is a member selected from the group consisting of quaternary ammonium halides, phosphonium halides, sulfonium halides, crown ethers, calixarenes and combinations thereof.

²³
~~35~~ 13. The process according to claim ~~1~~, wherein said phase transfer catalyst is a member selected from the group consisting of tetrabutyl ammonium iodide, tetraethyl ammonium iodide, benzyl trimethyl ammonium chloride and ethyl triphenylphosphonium bromide.

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34. The process according to claim ²³1, wherein the molar ratio of said hydroxyalkylating reagent to said dicarboxylic acid-functionalized material is from about 3.8 to about 4.5.

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35. The process according to claim ²³1, wherein said carboxylic acid-functionalized material is a member selected from the group consisting of carboxylic acid-functionalized polybutadiene and carboxylic acid-functionalized poly(butadiene-co-acrylonitrile).

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36. A dihydroxyl-functionalized material prepared by the process of claim ²³1.

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37. An adhesive, coating or sealant composition having improved toughness and elongation properties and curable through a gap of more than 40 mils, said composition comprising (a) a reaction product of (i) the dihydroxyl-functionalized material according to claim ²³1, and (ii) a molar excess of a reaction product of a molar excess of an aromatic or cycloaliphatic polyisocyanate and a compound selected from the group consisting of an aromatic or cycloaliphatic polyol, the reaction product of (i) and (ii) subsequently being reacted with a molar excess of a compound selected from the group consisting of a hydroxyalkyl acrylate, a hydroxyalkyl methacrylate, an amino alkyl acrylate, an amino alkyl methacrylate and combinations thereof; and (b) an initiator selected from the group consisting of free radical initiators and photo-initiators.

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38. The composition according to claim ³⁹17, wherein said polyisocyanate is a member selected from the group consisting of toluene diisocyanate and 4,4'-diisocyanate diphenyl methane; and the reaction product in (a) is an isocyanate-terminated hydrogenated bisphenol-A and toluene diisocyanate.

⁴¹
39. A process for preparing a dihydroxyl-functionalized material by hydroxyalkylating a dicarboxylic acid-functionalized material, said process comprising the step of: reacting as reactants